

# Profile and management outcomes of glaucoma cases at Qassim University Hospital

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## Introduction

Global estimates suggest that there could be 2.1 million blind and 4.2 million people with visual impairment due to glaucoma in the year 2010.<sup>[1]</sup> The global prevalence of glaucoma for population aged 40–80 years based on the review of prevalence surveys till 2013 was 3.54% with possible 64.3 million in 2013 and 76 million people with glaucoma in the year 2020. The risk and type of glaucoma vary by age, gender, race, and geographic locations.<sup>[2]</sup> The prevalence in 40 plus population in neighboring countries Qatar and Oman was 1.7% and to 4.75%. respectively.<sup>[3,4]</sup> Like many other countries to the best of our knowledge, community-based magnitude and determinants of glaucoma in Saudi population are not known. The World Health Organization, therefore, has developed “Tools for the Assessment of Glaucoma.”<sup>[5]</sup> In such situation, data on

## ABSTRACT

**Objective:** In view of the paucity of community-based data about glaucoma in Saudi Arabia, better planning to address visual disabilities due to glaucoma is a challenge. Providing hospital-based data from semi-urban places will complement the picture based on information of tertiary eye hospitals of capital.

**Methods:** This is one-armed cohort study. All patients attending glaucoma subspecialty unit at our university hospital during 2014–2015 were evaluated for their demographic details, ocular status at presentation, management modalities, and follow-up status of treated eyes. The qualified and absolute success rates (intraocular pressure <22 mmHg with/without medication) were estimated. The determinants of success were analyzed.

**Results:** We assessed 219 eyes of 122 patients of glaucoma patients. Bilateral glaucoma was in 97 (79.7%) patients. Primary chronic angle closure glaucoma in 102 (46.6%) eyes and primary open angle glaucoma (POAG) in 56 (25.6%) were the main types of glaucoma. More than half of the eyes with glaucoma had a normal functional vision, while 9.2% had vision <20/400. At presentation, 133 (60.7%) had undergone surgical procedure including laser iridotomy. At last follow-up, 135 (62%) of glaucomatous eyes were not using glaucoma medications. The decline in a number of glaucoma medications at last follow-up compared to 1<sup>st</sup> visit was statistically significant ( $P < 0.001$ ).

**Conclusions:** At tertiary eye center of semi-urban area of Saudi Arabia had primary chronic angle-closure glaucoma (PCACG) as the main type of adult glaucoma. Vision does not seem to understand the severity of glaucoma at presentation. POAG cases were medically managed while PCACG cases were managed both with laser and surgeries.

**Keywords:** Etiology, glaucoma, glaucoma medications, glaucoma surgery, intraocular pressure, visual disability

glaucoma from different institutions will also be useful in planning to address avoidable visual disabilities due to glaucoma.<sup>[6]</sup> Hospital-based profile of glaucoma patients in Riyadh and western province was analyzed.<sup>[7,8]</sup>

Our hospital is affiliated to the university, and in ophthalmology department, glaucoma subspecialty is providing eye care to the needy suburban population of the catchment area.<sup>[9]</sup> It is fully equipped with both diagnostic and therapeutic tool for glaucoma care. It would be interesting to study profile and management outcomes of glaucoma patients in the semi-urban area of the kingdom of Saudi Arabia.

We present the profile of glaucoma patients and management of glaucoma care given to our patients in our glaucoma unit between 2014 and 15.

## Methods

This was retrospective one-armed cohort study. Cases that were diagnosed and managed at glaucoma unit of our institute were included in this study. Ethical approval was obtained from the Institution Research Committee and written informed consent has been taken from all participants.

Two ophthalmologists and one epidemiologist were the field part of this study. They reviewed the electronic case records of the patients diagnosed with glaucoma.

Their demographic information included age at presentation, gender, location of residence, and nationality. Each person's health record-based systemic comorbidity such as hypertension, diabetes, hyperlipidemia, bronchial asthma, and cardiovascular disease was noted. Physician after thorough investigations concluded these diagnoses and even managed them with medications if needed.

The ocular assessment was carried out at a presentation by glaucoma specialist. Vision was assessed of each eye using Snellen chart projected from 6 m distance. If vision was <20/200, the assessment was done at 3-m distance along with the perception of light from four cardinal directions. The anterior segment of the eye was evaluated using slit-lamp biomicroscope (Topcon, USA). The intraocular pressure (IOP) was measured using applanation tonometer attached to the slit lamp. The central corneal thickness was measured using ultrasound pachymetry (Tomey SP-3000, Tomey Ltd, Japan). The anterior chamber angle was evaluated using a four-mirror Gonio lens (Volk Optical, Inc., Mentor, OH, USA).

The visual field was tested of each eye using a Humphrey automated perimeter (Carl Zeiss Meditec Group, Jena, Germany). Glaucoma VF damage was graded according to Modified GSS.

After careful evaluation of anterior segment and noting IOP, the pupil was dilated using 0.5% tropicamide one drop in each eye (repeated after 30 min if needed) to review the posterior segment.

The optic nerve head was assessed using stereoscopic digital fundus camera (Canon, USA). The colored digital images of the optic cup, optic rim, and peripapillary area were evaluated by a glaucoma specialist. The cup-disc ratio in vertical and horizontal meridian was measured using ImageJ software.<sup>[10]</sup>

The diagnosis and management of different types of glaucoma were based on international standards.<sup>[11,12]</sup>

In our university hospital, patients with primary open angle glaucoma (POAG) are primarily managed by medications. For cases in which a maximum of four medication do not allow us to achieve reduction of IOP to the target IOP, surgery is

recommended to the patient. The cases of primary angle closure glaucoma are managed by laser iridotomy and medication. However, they need filtration surgery earlier than cases of POAG.

The distance vision was further grouped as functional normal vision if it was 20/20–20/60, and moderate visual impairment was defined as vision <20/60–20/200. Severe visual impairment was defined as vision <20/200–20/400. Blindness was defined as vision <20/400.

The data were collected on a pre-tested data collection form. It was then transferred on spreadsheet of Microsoft XL®. After preparing the data for per glaucoma person and per glaucomatous eye, it was transferred into spreadsheet of Statistical Package for Social Sciences (SPSS 23, IBM, Chicago, USA). The continuous variables such as age and IOP were first plotted to study their distribution. If they were normal, we calculated the mean and standard deviations. If they were not having normal distribution, we calculated the median, 25% quartile, and minimum and maximum values. For a qualitative variable such as gender, eye affected, and laterality of ocular condition, we calculated frequencies and percentage proportions. For comparison of outcome variables among subgroups, for quantitative variables, we estimated difference of mean and their 95% confidence intervals (CI). For qualitative variables, we used Student's *t*-test to estimate odds ratio, its 95% CI, and two-sided *P* values. A value of <0.05 was considered as statistically significant.

## Results

Our cohort had 219 eyes of 122 glaucoma patients. Their median age was 59 years (25% quartile 49.8, minimum–12 and maximum 91 years). Male comprised of 71 (58.2%), Saudi national 114 (93.4%), and 25 (20.5%) unilateral glaucoma. Hypertension (43; 35.2%), diabetes (40; 32.8%), hyperlipidemia (5; 4.1%), coronary artery disease (2; 1.6%), and bronchial asthma (1; 0.8%) were main systemic comorbidities.

The distribution of type of glaucoma among 219 eyes with glaucoma is given in Figure 1. Primary chronic angle closure glaucoma constituted nearly half of eyes with glaucoma.

At the time of presentation, 133 (60.7%) had undergone surgical procedure including laser iridotomy. 95 (71.4%) eyes had one surgery, while the rest 38 (28.6%) had more than one surgeries. They included laser peripheral iridotomy (PI) (69; 31.5%), cataract (20; 9.1%), trabeculectomy (16; 7.3%), valve surgery (4; 1.8%), and trabeculectomy + other surgery (24; 10.9%). Among those managed by surgery/laser in the past, the IOP was more than >22 mmHg at presentation, thus needing active medical/surgical management. Of the 69 eyes that were managed by laser PI, IOL was >22 mmHg in 17 (24.6%) eyes.

The presented vision when visited our institution for the first time is given in Table 1. More than half of the eyes with glaucoma had normal functional vision, while 9.2% had vision <20/400.

The number of glaucoma medications for eyes with glaucoma before and after management at our institution is compared in Table 2.

The mean IOP of 216 eyes at presentation was 17.6 ± 6.5 mmHg (min: 9 and max: 49).

The median cup-disc ratio of 197 eyes was 0.7 (25% quartile 0.5, minimum: 0.3, and maximum: 1.0).

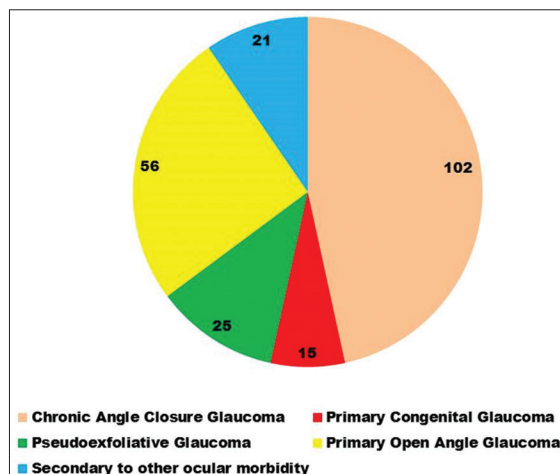
The angle of anterior chamber was closed in 95 (43.4%) of

**Table 1:** Distribution of distance visual acuity status of glaucomatous eyes on first visit

Presented distance vision	Number (%)
20/20–20/60	122 (55.7)
<20/60–20/200	64 (29.2)
<20/200–20/400	6 (2.7)
<20/400–PL+	17 (7.8)
No PL	3 (1.4)
Missing	7 (3.2)

**Table 2:** Topical eye medications before and after glaucoma management

Topical medications	Before	After	Validation
	Number (%)	Number (%)	
None	35 (16.0)	135 (61.6)	$\chi^2=126$ df=4 P<0.001
1	41 (18.7)	46 (21.0)	
2	65 (29.7)	28 (12.8)	
3	71 (32.4)	10 (4.6)	
4	6 (2.7)	0 (0.0)	
5	1 (0.5)	0 (0.0)	



**Figure 1:** The distribution of type of glaucoma among 219 eyes with glaucoma

glaucoma eyes. It was open in 121 (55.3%) eyes, and in three eyes, the status of angle could not be determined.

The male-to-female ratio in cases with primary chronic angle closure glaucoma was 1.2:1, while this ratio in persons with POAG was 2.2:1 ( $P = 0.09$ ).

## Discussion

The profile of glaucoma patients managed in a semi-urban city of Saudi Arabia suggested that the primary chronic angle closure glaucoma constitutes the main type of glaucoma followed by POAG. The surgical coverage for glaucoma at presentation was as high as 62%. The standard glaucoma management resulted in a substantial decline in a number of glaucoma medication. The visual status was of functionally normal in large proportions. Laser iridotomy in cases of angle closure glaucoma seems to be less effective resulting into a large number of CACG cases. Trabeculectomy with or without mitomycin adjuvant therapy is the surgery of choice among caregivers in this institution.

The pattern of glaucoma in Arabs differs from that of African where POAG is more common while Far East Asian population has inherent narrow-angle, resulting a high proportion of cases with PACG. The previous study in the western Saudi Arabia reported a higher rate of POAG (31%) compared to PACG (24.5%).<sup>[8]</sup> Another study in central Saudi Arabia revealed a higher proportion of PACG (47%) compared to 13% POCG.<sup>[7]</sup> The distribution of the type glaucoma in our study matched with the Obeidan *et al.*<sup>[7]</sup>

The surgical coverage of glaucoma cases included in the present study was more than 60%. More complex cases came to our tertiary eye hospital while simple and early glaucoma cases might be either undetected or being maintained with topical glaucoma medications by ophthalmologists of the private sector. It could also be due to failed interventions. The rate of failed surgery was 20.3% and failed laser PI was 24.6% in our study. The laser treatment for glaucoma in African and Asian patients with dark and thick iris is less than desired and needs two-stage approach.<sup>[13]</sup> Perhaps, eyes of adult Arabs could be with similar iris characteristics could be the reason for high failure rate.

In our study, male-female ratio among CACG and POCG cases was not significantly different. Female gender is a known risk for angle closure glaucoma.<sup>[14]</sup> Although the proportion of female with glaucoma was similar to males in the study, high risk of glaucoma in males than in females could be due to gender inequity in health access.

Older age is a known risk factor for glaucoma.<sup>[15]</sup> The participants of our study were mainly in their fifth decade of life. With increasing life expectancy in Saudi population, more and more glaucoma cases will seek ophthalmic services in coming years.

More than half of glaucomatous eyes at presentation had functionally normal vision (20/20 to 20/60) while one in eight glaucomatous eyes was with severe visual impairment. This confirms that vision could be a poor marker for early detection of glaucoma and opportunistic glaucoma screening while Saudi visit either ophthalmologist or optometrist eye is recommended to address visual disabilities due to glaucoma.

A low rate of glaucoma valve surgeries in our study is a matter of concern. The underlying causes of selected surgical procedures need further attention. Professionals of the study area should be trained in modern glaucoma surgeries, and patients also should be counseled for surgical options to manage glaucoma to have better long-term outcomes of glaucoma surgeries.

Secondary glaucoma was mainly due to diabetes complications or uveitis. With the high prevalence of diabetes and diabetic retinopathy in Saudi Arabia, NVI and NVG rates will be higher.<sup>[16,17]</sup> Early detection and proper management of underlying causes of secondary glaucoma will further reduce this risk of glaucoma.

Since in our institute, pediatric ophthalmologist is not yet available. Hence, glaucoma subspecialist provides eye care to all cases of glaucoma including pediatric glaucoma. Although congenital primary glaucoma cases were few and have different mode of care and assessment, we included in the present study. The findings of this subgroup should be compared to the adult glaucoma cases with caution.

For glaucoma patients, reduction in the number of medication as is noted in our study is always preferred. It has shown to improve the adherence to long-term glaucoma medication.<sup>[18]</sup>

Although association of diabetes and POAG is known, causal relationship is yet to be established.<sup>[19]</sup> Adiposity, especially in females, has been noted to be a risk factor for glaucoma.<sup>[20]</sup> In our glaucoma patients, only 4.1% had hyperlipidemia. This is in contrast to high dyslipidemia prevalence among Arab adult population.<sup>[21]</sup> Markers for adiposity, other than hyperlipidemia, need to be associated with the presence of glaucoma.

There were few limitations in our study. This being one-armed retrospective cohort, additional risk of glaucoma among examined population could be better studied in a prospective cohort study.

At tertiary eye center of the semi-urban area of Saudi Arabia had primary chronic angle-closure glaucoma (PCACG) as the main type of adult glaucoma. Vision does not seem to explain the severity of glaucoma at presentation. Cases of POAG were mainly managed medically, while cases of PCACG were first treated by laser and then surgery was offered. Such exercise of assessing the profile of glaucoma cases could be replicated in other regions of Saudi Arabia to understand the overall

picture of glaucoma till community-based information is generated. A surgical audit of patients with glaucoma should assess management outcomes and its predictors. The profile of glaucoma seen in semi-urban area of the central province has enabled the clinicians to understand main presentations.

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